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SURGERY IN THE AGED\*

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WHEN I was invited to participate in this program, it was suggested that there should be discussed the surgery of chronic disease in the aged. To do this I turned to our experiences at The New York Hospital-Cornell Medical Center and the associated Second Surgical Service of Bellevue Hospital, for material upon which these remarks would be based. It soon became evident that surgery in the aged does not lend itself readily to the partition of acute and chronic conditions because the basic disease may be more important than the phase for which surgery is undertaken. Furthermore in reviewing our overall experience in administering surgical therapy to those 65 years and over, it seemed significant that there were four conditions that emphasized the problems which confronted the surgeons in this endeavor. I would like to discuss these conditions because they are encountered whenever there are the aged to be cared for and because they present somewhat different manifestations than when observed in younger individuals. The approach to the aged patients is to be varied to meet the individual problems that

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arise if optimum results are to be obtained. The four conditions to be considered are: Biliary tract disease; Appendicitis; Intestinal obstruction and Diverticulitis (Diverticulosis).

### BILIARY TRACT DISEASE

Conditions arising from the biliary tract provide the most frequent single incident for abdominal surgical intervention in geriatric patients in our experience at The New York Hospital-Cornell Medical Center. Cutler,<sup>1</sup> Strohl and Diffenbaugh<sup>2</sup> have also reported the frequency and importance of cholelithiasis and cholecystitis in the aged.

During the 22 year period (September 1, 1932 to September 1, 1954) 360 cases of nonmalignant biliary tract disease, in patients 65 years of age or over, were treated by surgery at The New York Hospital-Cornell Medical Center. There were 25 deaths in this group, a mortality rate of 6.9 per cent. During the same period 1432 patients, 50 to 64 years of age (with a mortality rate of 2.4 per cent), and 2389 patients, under 50 years of age (with a mortality rate of 0.6 per cent), were treated for similar conditions.

MORTALITY RATE BY AGE GROUPS ON 4181 PATIENTS FOLLOWING SURGERY FOR NONMALIGNANT DISEASE OF THE BILIARY TRACT

<i>Age</i>	<i>No. of Patients</i>	<i>No. of Deaths</i>	<i>Mortality Rate</i>
Under 50 years .....	2389	15	0.6%
50-64 years .....	1432	34	2.4%
65 years and over .....	360	25	6.9%
<i>Total</i> .....	4181	74	1.78%

*Diagnostic Classification:* Two hundred and fifty of these geriatric patients were treated for chronic cholecystitis, 98 for acute cholecystitis, and 12 for postoperative and other benign strictures of the choledochus. The percentage of patients with acute cholecystitis as opposed to chronic biliary tract disease in the total series was 19.04 per cent among those under 50 years of age, 20.8 per cent among those 50 to 64 years of age, and 25.5 per cent among those 65 years of age and older.

*Preoperative Evaluation:* The presenting symptoms of biliary tract disease in the older age group varied little from the others. The more advanced changes in the biliary tract, resulting from long-standing disease such as common duct stone and biliary cirrhosis, were of course more frequent. The differences observed in the older age group in comparison to the younger patients included the systemic degenerative changes, all of which have a bearing on the outcome of any surgical therapy.

For the purpose of attempting to predict the occurrence of post-operative fatalities and complications, the 360 operative cases were classified according to the major degenerative disease processes discernible in their preoperative state. The mortality for the entire group was 6.9 per cent (25 postoperative deaths).

PREOPERATIVE EVALUATION OF 360 PATIENTS (65 YEARS OF AGE AND OLDER) WITH RESPECT TO THE PRESENCE OF DEGENERATIVE DISEASE PROCESSES

	No. of Patients*	Non-Fatal Complications	Mortality
No major degenerative disease .....	135	20 (14.8%)	4 (2.9%)
Hypertensive cardiovascular disease .....	144	25 (17.3%)	10 (6.9%)
Arteriosclerotic heart disease .....	60	12 (20.0%)	5 (8.3%)
Diabetes mellitus (moderate to severe).....	19	2 (10.5%)	—
Chronic pulmonary disease .....	22	2 (9.1%)	2 (9.1%)
Cirrhosis .....	6	—	2 (33.3%)
Chronic renal disease .....	6	1 (16.6%)	1 (16.6%)
Miscellaneous major chronic disease.....	14	2 (14.3%)	2 (14.3%)

\* 41 patients are classified in two groups  
1 patient is classified in three groups

1. One hundred and thirty-five patients (not the largest group) were regarded as having no major degenerative disease process. These patients did have some degree of generalized arteriosclerosis, osteoarthritis, diverticulosis, or benign prostatic hypertrophy. They did not have the disease processes listed to a major degree. There were 20 non-fatal complications (14.8 per cent) and four fatalities (2.9 per cent) among the aged patients in this group without recognized major disease processes.

2. Hypertensive cardiovascular disease was present in 144 patients (the largest group). These were patients with a sustained systolic blood pressure over 160 or diastolic blood pressure over 90. They had enlarged hearts with left ventricular preponderance. The highest consistent pressure was 230/120. There were no cases of malignant hypertension. There were 25 non-fatal complications (17.3 per cent) and 10 deaths (6.9 per cent) following surgery in this group.

3. Arteriosclerotic heart disease of a significant degree was noted in 60 patients. These individuals had sustained previous coronary occlusion (by electrocardiographic study) or had demonstrated electrocardiographic changes of a less marked degree associated with angina pectoris or cardiac decompensation. There were 12 non-fatal complications (20 per cent) and five deaths (8.3 per cent) in this group following surgical intervention for biliary tract disease.

4. Severe chronic primary pulmonary disease was present in 22 cases, consisting of severe emphysema and bronchiectasis. There were two non-fatal complications (9.1 per cent) and two fatalities following surgery among these patients.

5. Diabetes mellitus of a degree requiring a significant daily insulin administration was present in 19 cases. There were two non-fatal complications (10.5 per cent) and no postoperative deaths in this group.

6. Cirrhosis, complicated by either hemorrhage from esophageal varices, ascites, or jaundice, was present in six instances (by preoperative evaluation). There were two postoperative deaths in this group (33.3 per cent) following biliary tract surgery.

The most striking conclusion to be drawn from an analysis of these patients is that an elective biliary tract procedure is tolerated remarkably well by the geriatric patient; in fact the difference in the complication rate and mortality rate between the aged (over 65 years) and the control (50 to 64 years) group is not great. In contrast, the aged patient tolerates emergency biliary tract procedures, either for simple acute cholecystitis or for acute cholecystitis with choledocholithiasis, relatively poorly. Both mortality and complication rates are strikingly higher than in patients in younger age groups. This observation supports the concept that elective cholecystectomy in the aged patient with symptomatic biliary tract disease is even more important than in the younger patient, who can better tolerate the emergency procedure if such becomes necessary. The aged patient, even with advanced

degenerative disease processes, when carefully evaluated and prepared for surgery, may be operated upon with a mortality of less than 2 per cent. In acute cases the improvements in all types of preoperative and postoperative care of biliary tract patients have produced notable reductions in mortality and complication rates in the younger age groups; but in the aged the mortality for such procedures remains above 5 per cent.

In any discussion of biliary tract conditions requiring surgery one should keep in mind the possibility of acute cholecystitis developing after surgery directed at some other organ or system.<sup>3</sup> Over the past ten years several reports have emphasized that acute cholecystitis is a complication that is not rare following surgical procedures. It is most frequently seen in the older patients who have gallstones albeit these may not have been previously recognized. Fasting with the consequent storage of concentrated bile in the gallbladder and the sudden attempt of that organ to empty itself when food is taken, is believed to provide the mechanism for the production of a fulminating obstructive type of acute cholecystitis. The failure to recognize and properly treat acute cholecystitis in the aged may be followed by perforation of the gallbladder, peritonitis, and death.

#### APPENDICITIS

The mortality rate for appendicitis treated surgically has been greatly reduced in recent decades. Tashiro and Zinniger<sup>4</sup> in reviewing the experience at the Cincinnati General Hospital reported the following:

<i>Year</i>	<i>Mortality Rate</i>
1915-1934.....	6.4 per cent
1934-1939.....	4.8 per cent
1939-1944.....	3.3 per cent

Hawk, Becker and Lehman<sup>5</sup> in an analysis of their experience with appendicitis at the University of Virginia Hospital also noted a marked improvement. They have reported:

<i>Year</i>	<i>No. of Pts.</i>	<i>Mortality Rate</i>
1933-1937.....	1069	3.27 per cent
1943-1948.....	1003	0.8 per cent

These and other representative clinics throughout the country are in close agreement. In 1952 Wolff and Hindman<sup>6</sup> on the Second Surgical Division (Cornell) Bellevue Hospital reviewed a consecutive series of 88 patients over 60 years of age with acute appendicitis who were operated upon. For the decade of 1940-1949, the mortality was 4.5 per cent. During the same period a control group of 274 patients in an age range of 30-49 years of age, were operated upon with only two deaths, a mortality rate of 0.7 per cent. Equally striking was the high incidence of major complications; 41 per cent in the former and 12 per cent in the latter.

Thus while it is true that appendicitis treated surgically has resulted in an ever-decreasing mortality rate over the past 50 years there remains in the older age group an opportunity for further improvement. With a greater proportion of our population living into the older age group it is well for us to emphasize the following:

1. Acute appendicitis occurs in all ages.
2. Acute appendicitis in the aged may be attended with mild symptoms of insidious onset.
3. At present the mortality due to appendicitis is concentrated chiefly in the older age group.
4. The older age group when carefully evaluated and prepared withstand operation well.

1. *Acute appendicitis occurs in all ages:* Although the majority of patients who develop acute appendicitis are young adults it is to be seen in all ages. In the very young, infants and small children, diagnosis may be difficult. The same may be said for the opposite extreme of life in the aged. Hunter<sup>7</sup> in an analysis of diagnostic errors collected from case records at the Massachusetts General Hospital over a recent 25 year period found that 100 different diseases were misdiagnosed for a total of 470 errors. Eleven of these 100 diseases were misdiagnosed ten or more times. Eleven of the diagnostic errors concerned acute appendicitis.

2. *Acute appendicitis in the aged may be attended with mild symptoms of insidious onset:* Cutler reported that one of his patients gave only a history of vague abdominal pain of four days duration and yet at operation a well developed abscess was found. We have observed patients over 65 who have had sudden onset of abdominal pain with nausea and vomiting that enabled us readily to make a diagnosis of

acute appendicitis, but we too have seen more patients in the older age group in whom the history, laboratory data and physical findings were atypical. The diagnostic problem was far from simple. We have made errors in two ways. First, we have diagnosed some other condition when the patient had appendicitis. An example was that of a 72 year old physician who following a game of handball with a junior colleague noted a dull aching pain in the RLQ where he was able to palpate a mass. I saw him about two hours after his discovery and it was my impression that he had a tumor of the cecum. He believed it was an appendiceal abscess. At operation it was demonstrated that his diagnosis was correct and he lived for nine years to later die of arteriosclerosis. Secondly, we have made the diagnosis of appendicitis and then found at operation that we were wrong. An example was that of a 67 year old woman upon whom a gastric resection for ulcer had been done two years before. She suddenly developed generalized abdominal pain with nausea and vomiting 14 hours before admission to the hospital. There was an elevation of temperature to  $37.4^{\circ}$  with tenderness over the RLQ. Leukocytosis count was 14,000. My diagnosis was acute appendicitis but at operation a napkin-ring type of carcinoma of the ascending colon was found. The appendix was normal.

These two patients lend emphasis to the difficulties of diagnosis in the aged patients. Differential diagnosis requires the consideration of a wider range of conditions than in the younger age groups, and a more acute awareness of minimal signs and symptoms. In a sense we are less experienced, because in the past we have had fewer patients in the older age group. But now that each year they compose an increasing proportion of our total population we are gaining more experience, and we may expect that our ability to make the correct diagnosis will improve.

So far as appendicitis is concerned it may be said that the principles established for its treatment in other age categories should be applied to the aged. When a diagnosis of acute appendicitis has been made or when it is a likely diagnosis, operation should be done. Peritonitis from a perforated appendix and its complications are associated with a high mortality rate. Antibiotics will not protect such a patient. Appendectomy for appendicitis and/or drainage for an appendiceal abscess afford the most effectual treatment for all ages including those over 65 years. I am convinced that the risk of an abdominal operation in the presence

of the findings commonly associated with an "acute abdomen" is minimal compared to that assumed when non-surgical treatment or prolonged "watchful waiting" is followed. Emphasis should be placed on the fact that the older age patients will stand surgical procedures well if there are not complications, such as massive infection, which place an additional burden upon the remainder of the body economy, particularly the cardiovascular and renal systems which frequently lack the reserve they had earlier in the more robust period of life. In the aged these systems often have various degrees of impairment and will not withstand additional increments.

3. *At present the mortality due to appendicitis is concentrated chiefly in the older age group:* Fifty years ago the mortality rate of appendicitis in this country was high for those operated upon. It was estimated at 11 per cent in 1905. Then and for many years thereafter it remained high and perhaps was higher than the estimate because many individuals died without a correct diagnosis being made; hospital facilities were not available to those somewhat removed from the larger towns and cities. Today the mortality rate is estimated at 0.1 per cent and it is a much more accurate figure. The profession is better trained, the public more informed and greatly increased facilities are available for diagnosis and treatment. It is unusual for a patient nowadays to come into The New York Hospital-Cornell Medical Center with symptoms of appendicitis of more than a few hours' duration. Thirty years ago the reverse was true. As a result death from appendicitis is rare indeed. Those with complications and those who die fall into the older age group. I think the explanation is evident and that in the future the aged with appendicitis will be more accurately diagnosed and more promptly treated. The course of events then will parallel that of the younger segment of our population.

#### INTESTINAL OBSTRUCTION

In 1933 a 72 year old woman was admitted to The New York Hospital-Cornell Medical Center because of abdominal pain and vomiting of three days' duration. She had a strangulated femoral hernia. She was markedly dehydrated and in shock. Her prognosis was grave indeed. Following partial restoration, according to calculation, of fluid and electrolytes and gastric decompression, Poupart's ligament was divided under local anesthesia. The gangrenous bowel was excised



and the divided bowel ends exteriorized. She recovered later, and end-to-end anastomosis was done to reestablish bowel continuity. The site of the obstruction was proximal ileum.

Intestinal obstruction is always a serious condition and must be corrected. In general the higher in the gastrointestinal tract is the obstruction, the more rapidly devastating is the clinical course. The aged patient with reduced physiological capacity and often with impaired function tolerates intestinal obstruction less well than the young and vigorous. It is essential therefore that it be recognized early and treated with dispatch. We have kept a careful record of our experience with patients over 65 years of age with intestinal obstruction who have been treated on the surgical pavilions of The New York Hospital—Cornell Medical Center.<sup>8</sup>

There were 120 patients over the age of 65 with acute mechanical intestinal obstruction. The average age was 71.8 years. There were 19 deaths, an over-all mortality of 15.08 per cent. The average age of the fatalities was 74.8 years.

The etiologies of the intestinal obstructions fell into a natural classification and are listed in the following table.

ETIOLOGICAL INCIDENCE OF INTESTINAL OBSTRUCTION IN  
120 AGED PATIENTS

<i>Etiology</i>	<i>No. of Cases</i>	<i>Percentage</i>
External hernia (all types) .....	39	32.51%
Adhesions .....	28	23.30%
Neoplasm .....	21	17.50%
Diverticulitis (colon) .....	9	7.50%
Volvulus .....	7	5.84%
Internal hernia .....	4	3.34%
Mesenteric occlusion .....	4	3.34%
Obstruction of anastomosis (colon) .....	4	3.34%
Gallstones .....	3	2.50%
Stricture (ileum) .....	1	0.83%

External herniae, adhesions and neoplasms comprise the bulk of the cases in a proportion similar to the etiologies of intestinal obstruction in younger individuals. The 39 cases of external herniae were subdivided

as follows: 17 femoral, 14 inguinal, five ventral and three umbilical. Of the 21 cases of neoplasms, 16 were in the left colon, three in the right colon and two in the small intestine.

The results of operative and non-operative treatment in respect to the etiologies are shown in the following table.

#### OPERATIVE AND NON-OPERATIVE FATALITIES

<i>Etiology</i>	<i>Operative</i>		<i>Non-Operative</i>	
	<i>No. of Cases</i>	<i>Deaths</i>	<i>No. of Cases</i>	<i>Deaths</i>
External hernia .....	39	1	0	0
Adhesions .....	25	2	3	1
Neoplasm .....	21	6	0	0
Diverticulitis .....	6	1	3	0
Volvulus .....	6	2	1	1
Internal hernia .....	4	0	0	0
Mesenteric occlusion .....	1	1	3	3
Obstruction of anastomosis .....	4	0	0	0
Gallstones .....	3	1	0	0
Stricture .....	1	0	0	0
<i>Total</i> .....	110	14	10	5

An emergency operation was performed as the definite form of treatment in 110 cases. There were 14 deaths, an operative mortality of 12.73 per cent. Of the 10 remaining patients, five survived as a result of successful non-operative treatment and five succumbed, a non-operative mortality of 50 per cent. Four of the five non-operative patients who died were considered too ill to undergo an operation and in one a diagnosis of intestinal obstruction was not made.

Our experiences in the treatment of small bowel obstruction are summarized in the following two tables. There was a total of 80 cases of small bowel obstruction with 11 deaths, a mortality of 13.7 per cent. Simple small bowel obstruction occurred in 45 cases with four deaths, a mortality of 11.2 per cent. Seven deaths occurred in the 35 cases of strangulated small bowel obstruction, a mortality of 20 per cent. Four of the seven deaths in strangulated small bowel obstruction were not operated upon; accounting for the increased mortality.

## SMALL BOWEL OBSTRUCTION

<i>Etiology</i>	<i>Single Obstruction</i>		<i>Strangulated Obstruction</i>	
	<i>No. of Cases</i>	<i>Deaths</i>	<i>No. of Cases</i>	<i>Deaths</i>
Femoral hernia .....	6	0	9	0
Inguinal hernia .....	2	0	11	1
Ventral hernia .....	2	0	2	0
Umbilical hernia .....	0	0	3	0
Adhesions .....	25	3	2	0
Mesenteric occlusion .....	0	0	4	4
Volvulus .....	2	0	3	2
Internal hernia .....	3	0	1	0
Gallstones .....	2	1	0	0
Neoplasm .....	2	0	0	0
Stricture .....	1	0	0	0

## MORTALITY IN SMALL BOWEL OBSTRUCTION

	<i>No. of Cases</i>	<i>Deaths</i>	<i>Percentage</i>
Simple small bowel obstruction .....	45	4	8.8%
Strangulated small bowel obstruction .....	35	7	20.0%
<i>Total Cases</i> .....	80	11	13.75%

The experiences with large bowel obstruction are summarized in the tables below. There was a total of 40 cases of large bowel obstruction of which eight died, a mortality of 20 per cent. Seven deaths occurred in 35 cases of simple large bowel obstruction and one death occurred in the five strangulated large bowel obstructions. This high mortality rate is not surprising as almost half of the large bowel obstructions were due to carcinoma, and three of the eight deaths were the result of terminal carcinomatosis.

## LARGE BOWEL OBSTRUCTION

<i>Etiology</i>	<i>Single Obstruction</i>		<i>Strangulated Obstruction</i>	
	<i>No. of Cases</i>	<i>Deaths</i>	<i>No. of Cases</i>	<i>Deaths</i>
External hernia .....	1	0	3	0
Adhesions .....	1	0	0	0
Volvulus .....	0	0	2	1
Diverticulitis .....	9	1	0	0
Gallstones .....	1	0	0	0
Carcinoma left colon .....	16	5	0	0
Carcinoma right colon .....	3	1	0	0
Obstruction of anastomosis .....	4	0	0	0

## MORTALITY IN LARGE BOWEL OBSTRUCTION

	<i>No. of Cases</i>	<i>Deaths</i>	<i>Percentage</i>
Simple large bowel obstruction .....	35	7	20%
Strangulated large bowel obstruction .....	5	1	20%
<i>Total Cases</i> .....	40	8	20%

A comparison of the mortality rate in simple vs. strangulated obstructions (occurring in either the large or small bowel) showed a mortality of 13.7 per cent (11 deaths in 80 cases) in simple obstructions and a 20 per cent mortality (eight deaths in 40 cases) in strangulated obstructions.

The causes of death were varied and are summarized below:

## CAUSES OF DEATH

<i>Causes</i>	<i>No. of Cases</i>	<i>Percentage of Total</i>
Shock and peritonitis secondary to obstruction.....	8	42.2%
Cardiovascular .....	4	21.0%
Carcinomatosis .....	4	21.0%
Peritonitis secondary to operation .....	2	10.5%
Fluid and electrolyte imbalance .....	1	5.3%

Shock and peritonitis were the most common causes of death. It occurred in eight cases directly due to the effects of the intestinal obstruction. In two cases it occurred as a complication of the operation. In one case the patient died of fluid and electrolyte imbalance. This makes a total of 11 deaths resulting directly or indirectly from the intestinal obstruction. Of the remaining eight deaths, four were cardiovascular in nature and four were due to terminal carcinomatosis. Eliminating the deaths from terminal carcinomatosis, it is apparent that many of the fatalities might have been prevented had prompt and efficient treatment been carried out.

From our experience with intestinal obstruction in elderly patients we, with others, believe that they are less able to withstand the complications of shock and peritonitis than are the younger and more robust. We contend therefore that indicated treatment instituted promptly will best enable us to care for the aged with a low mortality.

## DIVERTICULITIS

Welch, Allen and Donaldson<sup>9</sup> reported that in a check of 2000 consecutive barium enemas done in the Massachusetts General Hospital over a three year period (1950, 1951, 1952) they found that neither diverticulosis nor diverticulitis of the colon was observed below the age of 35, and that it gradually increased thereafter so that at 85 years of age or older, two-thirds of the patients were found to have diverticula. They also report the incidence of diverticulitis likewise increases with age. For example, one-fifth of the patients in the sixth decade of life who had diverticulosis also had diverticulitis; whereas, in the ninth decade this fraction had increased to one-third.

Over a five year period, from 1947-1951 inclusive, on the surgical service of The New York Hospital-Cornell Medical Center we treated 102 patients with acute diverticulitis of the colon.<sup>10</sup> Their average age was 60.2 years. Forty-one or 40 per cent required some surgical operation, a total of 85 procedures being done on this group. For the remainder, or 60 per cent, response to conservative measures was satisfactory so far as immediate treatment was concerned. It should be kept in mind that a patient who has diverticulosis and has had an episode of diverticulitis may well have additional attacks and their future course is unpredictable. Diet regulation with accessory medications such as mineral oil or Metamucil to keep the stools soft and movements regular provide satisfactory management for many patients.

Of course we are here concerned with those who require surgery. They may be placed in two categories for the purpose of discussion. First, there are those in whom the indications for operative treatment are urgent and secondly there are those who may be approached with greater deliberation thus allowing time for meticulous preparation.

1. *Patients requiring immediate surgery:* If, because of the severity of the patient's signs and symptoms, an exploratory laparotomy is deemed advisable and a diagnosis of diverticulitis thereby established, we believe a transverse colostomy should be done at that time. Of the five patients who had an exploratory laparotomy with drainage, two had to have a transverse colostomy shortly thereafter. Diverting the fecal stream permits the inflammatory process to subside. Resection of the diseased portion of the bowel is the ultimate aim, but to do so in the face of acute inflammation is hazardous and unjustified. By put-

ting the distal segment at rest for a time, the resection may be undertaken at a later date with much less risk. Simple stab wound drainage does not provide adequate treatment for the primary process of the disease. If an abscess is found in the pelvis, it should be drained by lateral stab wounds, but the transverse colostomy should still be done.

Postoperatively, the patients are maintained on nothing by mouth, indwelling nasal-gastric tube suction, parenteral fluids, and antibiotics. Special attention is given to electrolyte and fluid balance during the immediate postoperative period. The colostomy is usually opened on the second to third day, depending on the degree of distention of the bowel. After opening the colostomy the gastric tube is removed and fluids are started by mouth. Colostomy irrigations are started on the seventh postoperative day in an effort to achieve early control over the discharge. The antibiotics are continued for about ten days to two weeks postoperatively.

The length of time between colostomy and resection is an individual problem and must be determined by clinical and x-ray findings. Persistent elevation of temperature, and white cell count, and abdominal or rectal tenderness are all contraindications to resection. X-ray evidence of severe spasm is also a contraindication, but it is seldom necessary to wait for complete disappearance of bowel spasm before undertaking resection because vestiges of inflammation may remain for more than a year. Combining the findings from periodic clinical and x-ray examinations, a satisfactory time may be chosen for resection that is necessarily neither delayed after colostomy nor so early that that patient's welfare is jeopardized.

2. *Patients for whom indicated surgery is not urgent:* Mature, sound surgical judgment is essential to accomplish the desired result in these individuals. The crux of the problem centers about (a) the indications for resection of the bowel with diverticulitis; (b) when should a resection be preceded by a colostomy and when may a primary resection with immediate restoration of continuity be done; (c) the extent of the resection when there is a wide distribution of diverticula and a localized area of diverticulitis.

We believe that obstruction, perforation, with or without abscess or fistula formation, severe pain, and questionable lesions that resemble carcinoma should all be treated surgically. Hemorrhage may require surgery, but the source of bleeding must be evaluated carefully in

order to avoid continuation of bleeding after a resection that was intended to be curative. Once a resection has been deemed necessary, the patient is placed on large bowel preparation, consisting of a clear fluid diet and appropriate antibiotics. Purging is contraindicated for fear of causing acute exacerbation of the inflammatory process. Patients with colostomies who are being prepared for bowel resection are given gentle irrigations of the distal loop with saline or water to which Aureomycin or Terramycin has been added in order to facilitate adequate preparation of the bowel.

When a patient has any degree of large bowel obstruction, perforation or fistula formation, we believe that a colostomy is indicated as a primary procedure. If at the time resection is contemplated, whether as a primary or secondary procedure, there is still sufficient inflammation to render dissection and resection hazardous, then the procedure should be terminated and only a colostomy done if it has not been done before. Further time and preparation will reward the surgeon with a much easier resection, a better anastomosis and should be less dangerous to the patient.

As with the acute surgical cases the optimum time between complete diversion of the fecal stream by colostomy and elective resection varies with the degree of inflammation. Usually three to four months is a sufficient interval, although some cases may require as long as a year.

At the time of resection, should a vesicosigmoid fistula be excised, we close the bladder in two layers with catgut and place an indwelling Foley catheter in the bladder. Occasionally, when a large segment of the bladder is removed, a suprapubic cystotomy tube is used in addition to the Foley catheter. This may usually be removed by the tenth post-operative day.

We have recently adopted a more radical procedure at the time of resection. X-rays commonly demonstrate the greatest degree of inflammation and predominance of diverticula to be in the region of the sigmoid. The descending colon may often have diverticula as well, which, though not acutely inflamed at this time, may become involved after the resection. For this reason we now resect both the sigmoid and a major portion of the descending colon. Mobilizing the splenic flexure may be tedious and may lengthen the procedure somewhat, but we believe that long-term follow-up studies will justify this policy. It has not increased the morbidity or mortality.

Following primary resection these patients are maintained on indwelling nasogastric tube suction, nothing by mouth, parenteral fluids and antibiotics until they begin to have active bowel sounds and expel flatus. At this time the tube is removed and oral fluids are begun. Since these patients are usually quite elderly, they do not tolerate electrolyte or fluid imbalance well. Therefore special attention is always directed at this problem. The diet is gradually advanced to a low-residue diet and mineral oil given to insure a soft stool. Antibiotics are usually discontinued by the seventh day after operation.

If a patient has had a preliminary colostomy, this may be closed from ten to twelve days after resection provided x-ray studies of the distal segment prove satisfactory. Postoperatively these patients are managed as a primary resection.

We have performed 85 procedures on 41 patients. There were two postoperative deaths, a mortality of 4.8 per cent. Both these fatalities occurred in the acute surgical emergency group. There was a total of 15 postoperative complications, an operative morbidity of 17.6 per cent.

#### POSTOPERATIVE COMPLICATIONS FOLLOWING SURGERY FOR ACUTE DIVERTICULITIS

Wound infections .....	4
Fecal fistulae .....	3
Pulmonary infarction without thrombophlebitis.....	2
Pelvic abscess .....	1
Urinary retention .....	1
Agranulocytosis .....	1
Cerebrovascular accident .....	1
Parotitis .....	1
Bowel perforation .....	1
	—
	15

Diverticulitis in the aged in our experience can be managed with conservative measures in about 60 per cent of instances. When surgery is indicated it should not be side-stepped because of the patient's age. Each individual requires careful evaluation and, insofar as possible, proper therapeutic measures utilized to neutralize any disorders that are



commonly encountered in the older age group. Searching out these conditions and anticipating their potential hazards should enable the surgeon to accomplish resection and reestablishment of colon continuity, with a mortality and morbidity of complications rate that is only slightly higher than found in those who are somewhat younger.

Because the incidence of diverticulosis increases decade by decade after 50, as does also the appearance of superimposed diverticulitis, we should anticipate that we are going to encounter problems relative to the management of these conditions more frequently in the future among those 65 years and older.

### DISCUSSION

Measures that provide better health result in long life. The proportion of our population 65 years and over is now the greatest it has ever been. It is presently estimated at approximately 14,000,000. The indications are that this trend will continue. Those who reach this age category are subject, as are those who are younger, to a wide range of conditions that are best treated by surgery. In the past there has been a tendency, still existent in many quarters, to withhold indicated surgery because of anticipated hazards, fancied and actual. The contraindications to surgical therapy among the aged commonly accepted a few decades ago are gradually being neutralized. This is taking place because many of the real problems inherent in undertaking surgical therapy are being studied and an adequate solution provided. The general advancements in surgery have enabled us to better solve the problems relative to anesthesia, water and electrolyte balance and impaired function of various organs and systems. The aged, like the very young, do not have as wide a margin of physiological functional reserve. They require greater precision of management. This includes preoperative evaluation and such correction of abnormal function as is practical. Recognition of these enables one to select the optimal accessories in surgical therapy. Our facilities and armamentarium were never better so that it is possible even in the poor risk patient of any age to proceed with greater safety upon any surgical procedure. Thus the aged patient with a condition requiring surgery is prepared and operated upon without undue delay and then mobilized immediately after recovery from the effects of anesthesia with minimal risk and disturbance to his or her overall normal physiological functional capacity.

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